ford, Ill., with average particle diameter of about 37 to about 177 microns and average pore size of, as starting material, about 40 to about 1000 Angstroms, and preferably CPG of about 40 to about 500 Angstroms is employed.

Among the inert organic solvents suitable for preparing the silica gel or CPG slurry are aliphatic hydrocarbons such as, for example, hexane, heptane and the like; aromatic hydrocarbons such as, for example, benzene, toluene, xylene and the like; chlorinated methanes such as for example, methylene chloride, chloroform, carbon tetrachloride and the like; and such other inert solvents as tetrahydrofuran, glyme, diglyme and the like. In general a 1:5 ratio of silica gel or CPG in grams to solvent in milliliters affords a suitable slurry. Due to the fine, insoluble nature of the particulate silica gel and CPG, a slurry rather than a true solution is obtained.

The carboalkoxyalkyl silanes are known or easily prepared. For example, carbomethoxyethyl trichlorosilane is readily prepared by reaction of methyl acrylate and trichlorosilane.

In general, about 25 to about 100 grams of the silane is used to react with each 100 grams silica gel or CPG. The reaction may be conducted to ambient temperature although elevated temperatures up to the refluxing temperature of the reaction solvent system may be utilized to enhance the rate of reaction. The reaction proceeds readily to substantial completion (Step 1) within 2–50 hours. Stirring during admixture of the reactants is advantageously employed although the reaction thereafter may continue without further stirring.

The resultant solid fraction is recovered from the reaction mixture by conventional physical means, for example, filtration, centrifugation and the like. In general, a filtering means sufficient to retain a particle size of 5 microns is suitable whereas centrifuging is suitable for a particle size of 3 microns.

The recovered solid fraction is then heat cured at a temperature and for a time sufficient to dry and completely bond the silane to the silica gel or CPG covalently. In general, from about 1–4 hours to about 40°–120° C. has been found sufficient.

The subject reaction products constitute new and useful bond phases for the purification, concentration and separation of THC-COOH and are particularly suitable for use with solid phase extraction instrumentation. The packing may be of various mesh sizes, for example, from about 50 to about 600 mesh. An example of the methodology suitable for purification and concentration or separation of THC-COOH is similar to that reported in the literature using other but much less effective and efficient bonded phases, for example, the methodology disclosed by M. Elsohyl, *J. Analytical Toxicology,* Vol. 7, pp. 262–264, November/December 1983.

Exemplary of the preparation of the new carboxyl free bonded phases according to the invention are the following representative examples.

EXAMPLE 1

To a slurry of 250 grams of silica (40μ 60 Å) in 1250 ml of toluene is added 75 ml of carbomethoxyethyl trichlorosilane with stirring. After about 20 minutes of stirring the mixture is allowed to stand for about 20 hours.

The mixture is then filtered, the filter cake product is washed with 2×800 ml of toluene, followed by 2×800 ml of methanol, dried and cured in an oven at about 80° to 85° C. for about 3 to 4 hours.

The product is then end capped by treatment as follows: to 295 grams of product slurried in 1500 ml of toluene is added 80 ml of trimethyl chlorosilane. The mixture is stirred for about 15 to 20 minutes, and let stand for about 2 to 3 hours, then filtered. The product is washed 2×1000 ml toluene and 2×1000 ml methanol, then dried in an oven at about 80° to 85° C. Yield about 300 grams.

EXAMPLE 2

To a slurry of 100 grams of silica gel (40μ 60 Å) in 500 ml of toluene is added 30 ml of carbomethoxyethyl dichloromethylsilane. The mixture is stirred for about 15 to 20 minutes and allowed to stand for about 16 hours. It is then filtered, washed 2×400 ml toluene and 2×400 ml methanol. The bonded phase is dried and cured in an oven at about 80° to 85° C. for about 3 to 4 hours.

Although this bonded phase product can be used as is for the chromatography, it is preferable to end cap the product.

To the cured product in 500 ml of toluene is added about 15 to 25 ml of trimethyl chlorosilane (or about 10 to 25 ml of hexamethyldisilizane). The mixture is stirred for about 2 to 3 hours, filtered, washed 2×1000 ml toluene and 2×1000 ml methanol, then dried in an oven to about 80° to 85° C.

EXAMPLE 3

To a slurry of 100 grams of silica gel (40μ 250 Å pore size) in 500 ml of toluene is added 25 ml of carbomethoxyethyl dimethylchlorosilane. The mixture is stirred for about ½ hour, let stand for about 6 to 18 hours, then filtered and washed with 2×400 ml toluene and 2×400 ml of methanol. It is then dried and cured at about 80° to 85° C. in an oven for about 3 to 4 hours.

Usually this bonded phase product does not need to be end capped, but if end capping is desired it can be accomplished in the manner set forth in Example 1.

As exemplary of the use of the bonded phase products of this invention in the cleanup of urine samples for analysis of cannabinoids reference may be had to the following Example. In the following Example the urine sample is first hydrolized to hydrolyze the conjugated form of THC-COOH to free form for chromatographic processing according to this invention. Typically such hydrolysis of a urine sample is conducted in the following manner. Three ml of urine, 3 ml of distilled water and 300 microliters of 10N KOH solution are added to a 15 ml screw top tube. The tube is capped and the solution mixed thoroughly and the tube placed in a 60° C. water bath for about 20 minutes. Following this hydrolysis step the ph of the hydrolysate is adjusted to a ph of 6 with the addition of the appropriate amount of concentrated HCL.

EXAMPLE 4

A standard 3 ml polypropylene solid phase extraction column cartridge (serological grade) is dry packed with 500 mg of the end capped bonded phase from Example 1. The bottom of this cartridge is then friction fitted via Leur type fitting onto a suitable vacuum manifold. The vacuum is then increased to 14 inches of mercury which results in a flow rate of 5 ml/minute. The column is then conditioned to rinse out solubles dry adding two 2 ml aliquots of methanol followed by two 2 ml aliquots of